

CLAIMS

What is claimed is:

- 1 1. A method comprising:
2 accessing a first multi-dimensional graphical representation that describes the
3 appearance of a plurality of points of an object from a plurality of
4 viewing directions, the appearance varying from point to point and
5 viewing direction to viewing direction;
6 creating a second graphical representation that approximates the first graphical
7 representation and that includes at least one expression having a fewer
8 dimensions than the first multi-dimensional graphical representation by
9 decomposing the first multi-dimensional graphical representation into
10 the second graphical representation, the decomposing including
11 selectively representing information from the first graphical
12 representation.
- 1 2. The method of claim 1, further comprising expressing the first graphical
2 representation as a matrix, and wherein creating the second graphical
3 representation includes using singular value decomposition to decompose the
4 first multi-dimensional graphical representation into a first vector multiplying a
5 second vector.
- 1 3. The method of claim 1, wherein creating by decomposing includes selectively
2 representing information from the first graphical representation that is most
3 important to describe the appearance of the object and neglecting redundant
4 information from the first graphical representation that is less important to
5 describe the appearance of the object.

1 4. The method of claim 1, further comprising:
2 accessing a third multi-dimensional graphical representation that describes the
3 appearance of a second plurality of points of the object from a plurality
4 of viewing directions, the second plurality of points including the first
5 plurality of points, and the appearance varying from point to point and
6 viewing direction to viewing direction; and
7 partitioning the third multi-dimensional graphical representation into a
8 plurality of smaller multi-dimensional graphical representations each
9 associated with a primitive of a polygonal representation of the
10 geometry of the object, the plurality of smaller multi-dimensional
11 graphical representations including the first multi-dimensional
12 graphical representation.

1 5. A method comprising:
2 accessing a first graphical representation that describes the appearance of a
3 plurality of points on an object;
4 creating a second graphical representation based on the first graphical
5 representation, the second graphical representation containing less
6 redundant descriptive information than the first graphical
7 representation, and the second graphical representation containing a
8 plurality of portions that are capable of being concurrently combined to
9 display the plurality of points of the object with an appearance
10 associated with a particular viewing direction.

1 6. The method of claim 5, wherein the first graphical representation describes the
2 appearance of a plurality of points of an object from a plurality of viewing

3 directions, the appearance varying from point to point and viewing direction to
4 viewing direction.

1 7. The method of claim 5, wherein creating includes creating a second graphical
2 representation that includes a plurality of portions capable of being expressed
3 as matrices, the method further comprising expressing the plurality of portions
4 as matrices.

1 8. The method of claim 5, further comprising:
2 storing the second graphical representation;
3 receiving a request on a network for the second graphical representation;
4 transmitting the second graphical representation on the network after receiving
5 the request.

1 9. The method of claim 5, wherein creating includes creating a second graphical
2 representation that includes a plurality of portions that can be combined using
3 multitexturing hardware that allows multiple textures to be concurrently
4 applied to a primitive in a single rendering pass.

1 10. The method of claim 5, wherein creating includes creating a second graphical
2 representation that includes a plurality of portions that are capable of being
3 concurrently combined without decompressing the plurality of portions.

1 11. The method of claim 5, further comprising:
2 accessing a third graphical representation that describes the appearance of a
3 second plurality of points of the object from a plurality of viewing
4 directions, the second plurality of points including the first plurality of

5 points, and the appearance varying from point to point and viewing
6 direction to viewing direction; and
7 partitioning the third graphical representation into a plurality of smaller
8 graphical representations each associated with at least one primitive of
9 a polygonal representation of the geometry of the object, the plurality
10 of smaller multi-dimensional graphical representations including the
11 first multi-dimensional graphical representation.

1 12. A machine-readable medium having stored thereon data representing
2 sequences of instructions that when executed cause a machine to perform
3 operations comprising:
4 accessing a first graphical representation that describes the appearance of a
5 plurality of points on an object;
6 creating a second graphical representation based on the first graphical
7 representation, the second graphical representation containing less
8 redundant descriptive information than the first graphical
9 representation, and the second graphical representation containing a
10 plurality of portions that are capable of being concurrently combined to
11 display the plurality of points of the object with an appearance
12 associated with a particular viewing direction.

1 13. The machine-readable medium of claim 12, wherein the instructions for
2 accessing the first graphical representation further comprise instructions
3 causing the machine to perform operations comprising accessing a first
4 graphical representation that describes the appearance of a plurality of points
5 of an object from a plurality of viewing directions, the appearance varying
6 from point to point and viewing direction to viewing direction.

1 14. The machine-readable medium of claim 12, wherein the instructions for
 2 creating further comprise instructions causing the machine to perform
 3 operations comprising creating a second graphical representation that includes
 4 a plurality of portions capable of being expressed as matrices.

1 15. The machine-readable medium of claim 12, wherein the instructions for
 2 creating further comprise instructions causing the machine to perform
 3 operations comprising creating a second graphical representation that includes
 4 a plurality of portions that can be combined using multitexturing hardware that
 5 allows multiple textures to be concurrently applied to a primitive in a single
 6 rendering pass.

1 16. The machine-readable medium of claim 12, wherein the instructions for
 2 creating further comprise instructions causing the machine to perform
 3 operations comprising creating a second graphical representation that includes
 4 a plurality of portions that are capable of being concurrently combined without
 5 decompressing the plurality of portions.

1 17. The machine readable medium of claim 12, wherein the instructions further
 2 comprise instructions causing the machine to perform operations comprising:
 3 accessing a third graphical representation that describes the appearance of a
 4 second plurality of points of the object from a plurality of viewing
 5 directions, the second plurality of points including the first plurality of
 6 points, and the appearance varying from point to point and viewing
 7 direction to viewing direction; and
 8 partitioning the third graphical representation into a plurality of smaller
 9 graphical representations each associated with at least one primitive of

10 a polygonal representation of the geometry of the object, the plurality
11 of smaller multi-dimensional graphical representations including the
12 first multi-dimensional graphical representation.

1 18. A method comprising:
2 accessing image-based data for an object that describes the appearance of the
3 object from a plurality of viewing directions;
4 dividing the image-based data into a plurality of smaller portions associated
5 with regions on the object;
6 standardizing each of the plurality of smaller portions;
7 creating a plurality of approximate graphical representations that approximate
8 the plurality of standardized portions by selectively representing certain
9 non-redundant information from each of the plurality of standardized
10 portions; and
11 storing each of the plurality of approximate graphical representations.

1 19. The method of claim 18:
2 wherein dividing the image-based data includes partitioning the image-based
3 data into a plurality of subsets of image-based data, each subset of
4 image-based data describing the appearance of a primitive-defined
5 region of the object for a particular viewing direction, each subset
6 having a higher degree of spatial coherency than the set of image-based
7 data;
8 wherein standardizing includes normalizing the size of each of the plurality of
9 subsets of image-based data to a predetermined size, normalizing the
10 shape of each of the plurality of subsets of image-based data to a
11 predetermined shape, and using the plurality of subsets of image-based

12 data to compute a resampled plurality of subsets of image-based data
 13 that correspond to predetermined standardized viewing directions; and
 14 wherein creating a plurality of approximate graphical representations includes
 15 creating for each primitive-defined region a first data structure that is
 16 independent of the viewing direction and a second data structure that
 17 includes a plurality of portions that each correspond to a different
 18 viewing direction.

1 20. The method of claim 18, further comprising:
 2 acquiring geometry data for an object that describes the geometric extents of
 3 the surface of the object;
 4 converting the geometry data into a geometric representation of the geometry
 5 of the object; and
 6 acquiring image-based data that describes the appearance of the surface of the
 7 object from a plurality of viewing directions.

1 21. The method of claim 18, further comprising:
 2 receiving a request for graphical content associated with the object from
 3 another computer system;
 4 transmitting a plurality of approximate graphical representations to the other
 5 computer system; and
 6 transmitting geometry data for the object to the other computer system.

1 22. A data structure comprising at least a first portion and a second portion, the
 2 second portion including a second plurality of view-dependent subportions
 3 including a first view-dependent subportion that corresponds to a first viewing
 4 direction and a second view-dependent subportion that corresponds to a second

viewing direction, wherein the first portion and the first view-dependent subportion are combinable using multitexturing hardware that allows multiple textures to be concurrently applied to a primitive in a single rendering pass to display a plurality of points of an object with a first appearance corresponding to a first viewing direction, and wherein the first portion and the second view-dependent subportion are combinable using the multitexturing hardware to display the plurality of points of the object with a second appearance corresponding to a second viewing direction.

23. The data structure of claim 22, wherein the data structure is derived from a plurality of images acquired for the object by selectively representing information from the plurality of images that is important to describe the appearance of the object and selectively removing information from the plurality of images that is redundant.

24. The data structure of claim 22, wherein the first portion and the first view-dependent subportion are combinable without decompression using the multitexturing hardware.

25. The data structure of claim 22, wherein the first portion and the second portion are created by decompressing a corresponding compressed first portion and a corresponding compressed second portion of another data structure.

26. A data structure comprising a plurality of portions that are combinable without interpolation to display a plurality of points of the object with a first appearance for a first viewing direction and display the plurality of points with a second appearance for a second viewing direction.

- 1 27. The data structure of claim 26, the data structure being derived from a plurality
2 of images acquired for an object by representing important information that
3 describes the appearance of the object and removing redundant information
4 associated with the plurality of images.
- 1 28. The data structure of claim 26, wherein the plurality of portions are
2 combinable without decompression.
- 1 29. The data structure of claim 26, wherein the plurality of portions are created by
2 decompressing corresponding compressed portions of another data structure.
- 1 30. The data structure of claim 26, wherein the plurality of portions include a first
2 matrix and a second matrix that are concurrently combinable using
3 multitexturing hardware that allows multiple textures to be concurrently
4 applied to a primitive in a single rendering pass.